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(12) DESCRIPTION OF AN INVENTION

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(54) METHOD OF MAKING FINE SCALY PARTICLES

Application: in the chemical industry to protect equipment from the abrasive wear, in construction, car and shipbuilding and anticorrosion coatings. Essence of the invention: basalt melt with the temperature of 1400-1500°C comes from the furnace to the draw plate, heated to the temperature of 1400°C. Through the orifice in the draw plate melt in the form of streams gets on the horizontal surface of rotating turbine, where scaly particles of the required fraction are chopped off. Depending on the required output, draw plate has 1-3 orifices, which diameters are determined by the required fraction (size) of scales and is within the limits of 4-10mm. Draw plate is built into the lower part of the smelting furnace tray. The melts outflow speed is 70-120 mm/sec. Turbines rotation speed is about 3000 min^{-1}. It is located on the distance of 200-500 mm far from the draw plate. A compressed air under the pressure of 2-4 atm. in amount of 3-9 m^3/min is supplied into the turbine zone from the main compressor plant or individual compressor, simultaneously with the streams chopping.

DESCRIPTION OF AN INVENTION.

Invention is related to production of scaly particles, and methods of fine scaly particles making from the mineral melt in particular, and can be used at the enterprises of the chemical industry for protection from the abrasive and corrosion wear of equipment, in construction, car and shipbuilding.

The purpose of invention: making of scaly particles of given fraction.

This can be reached by the method of fine scaly particles making, which includes heating of the mineral compound to the melting temperature, streams forming by means of draw plates, chopping off the stream into the particles with simultaneous cooling and removal with the air, differing in: chopping off the melt stream is conducted at the temperature of 900-1300°C. Streams are chopped mechanically, e.g. turbine, and thickness of scaly particles is determined in the following way:

$$T = \frac{d \cdot V}{\pi \cdot d \cdot n}, \text{ where}$$

d – diameter of the melt stream, mm;
V – melts stream outflow speed, mm/sec;

π – 3.14;
D – diameter, where stream meets the turbine, mm;
n – rotation speed of the turbine, sec^{-1}.

In case of mechanical chopping of the basalt melts stream into separate scales, the mentioned temperature interval 900-1300°C secures an optimal elasticity of the stream, when scales of equal sizes with the even and smooth shear surface. When temperature of chopping is lower than 900°C – scales become broken, «spiny» due to the increased fragility of the stream. At the temperature of chopping higher than 1300°C scales become strained and take cloddy shape due to higher fluidity of the stream. It is necessary to mention that outflow speed of the stream through the draw plate orifice will be different, depending on the diameter of the draw plate orifice and, hence, time, required for cooling the stream with the air. Therefore, distance from the draw plate to the line of the melts stream chopping will be different and is ascertained experimentally.

The proposed method advantage is in the definite temperature of the melt stream chopping into scales and choosing the optimal amount and diameter of the draw plate orifices, secures maximum separation of scaly particles of the definite fraction (1-5μm).

Moreover, method makes possible to adjust the process for making particles with equal sizes, and, hence, equal properties.

To accomplish the proposed method, the basalts melt with the temperature of 1400-1500°C from the smelting furnace comes to the draw plate, heated up to 1400°C. Melt in the form of stream comes through the draw plate orifices onto the horizontal surface of the rotating turbine, where scaly particles of the definite fraction are chopped. A draw plate has 1-3 orifices, depending on the required output, which diameter is determined by the required fraction (size) of the scale and is within the limits of 4-10 mm. Draw plate is built into the lower part of the smelting furnace tray. The melts outflow speed is 70-120 mm/sec.

Turbines rotation speed is about 3000 min^{-1}. It is located beneath the draw plate on the distance of 200-500 mm far from it. A compressed air under the pressure of 2-4 atm. in amount of 3-9 m^3/min is supplied into the turbine zone from the main compressor plant or individual compressor, simultaneously with the streams chopping. Temperature of the melt in this zone reduces for 50-100°C, because draw plate is heated to the temperature of 1400°C and stream path from the draw plate to the chopping zone is within the limits of 200-500mm. Therefore, melts temperature in the chopping zone is 900-1300°C. The proposed method presumes a mechanical chopping of the melt stream by means of the turbine. There are two types of turbine: with the flat chopping surface and «ribbed» (with blades); the upper surface chops scales of the fraction required. The amount of turbines blades – 4-12 and depends on the definite size of scales.

As a consequence of experiments ran, a high percentage (80-90%) of fine particles of the fixed fraction was reached. Sizes of these particles (thickness and diameter) were measured under the microscope and deviation from the round shape by diameter was checked. The deviation scope «K» was determined as the ratio of the ellipse shorter axis to the longer axis and was within the limits $0.80 \cong K \cong 0.95$.

Results of the particles sizes comparison, made in accordance with the proposed method and particles, made by the prototype method, were analyzed and given in the table.

A photo of the scale, made in accordance with this method is attached.

Thus, the proposed method of fine scaly particles production secures a production of particles of required sizes with the high percentage of output and make it possible to easily adjust the production process for making particles with different degree of dispersion. Moreover, scales produced in accordance with the proposed method are cheap chemical-, water- and abrasive-resistant stuff, which can be widely used in compound of absorbers protective coatings in the sulfur rectification unit, bottoms of cars and ships, chemical pipelines and equipment.

Total benefits from the application in one absorber of the sulfur rectification unit is 1.5 mln.rub.

SUBJECT OF AN INVENTION

1. Method of the fine scaly particles production, which **includes** heating of the mineral compound to the melting temperature, streams forming by means of draw plates, chopping off the stream into the particles

with simultaneous cooling and removal with the air, **differing in**: chopping off the melt stream is conducted at the temperature of 900-1300°C. Streams are chopped mechanically, e.g. turbine.

2. Method by cl. 1, differing in the condition, which determines the particles thickness:

$T = \frac{d \cdot V}{\pi \cdot d \cdot n}$, where

d – diameter of the melt stream, mm;
V – melts stream outflow speed, mm/sec;
D – diameter, where stream meets the turbine, mm;
n – rotation speed of the turbine, sec^{-1}.

3. Method by cl. 1, differing in the amount of orifices in the draw plate – 1-3 orifices of the definite diameter.

NOTIFICATION ABOUT THE CHANGES IN THE LEGAL STATUS

Code of changes:	**MM4A – advanced expiration of the RF patent due to non-payment of the renewal fee**
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Date of the patent expiration:	**1996.03.25**

Table 1

Comparison of the linear dimensions of the scaly particles

Production method	Deviation scope, K	Difference in thickness per 100 particles, μm	Edge irregularities	Possibility to adjust the particle size
Prototype	0.2-0.6	up to 8	Edges are broken, «spiny»	–
Proposed	0.8-0.95	up to 3	Edges are flat and rounded	+